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ABSTRACT

In reviewing the research of experimental psychology, genetic psychology, and psychopathology, the author finds the data show: (1) the extreme importance of the period between the third and sixth year when the Oedipus situation of the child is resolved and when he takes the first step in the use of reason; (2) the importantce of the latency period between the second stage of childhood and puberty which corresponds to the sublimations necessary for the intellectual tasks to be performed emotively; (3) the processes of conditioning which bring into play the instrumental means of knowledge and a system of motivations for knowledge; and (4) current teaching practices as they correspond to systems of values and not to "scientifically objective" data. Permanent education can succeed only when this data can be used to modify current childhood development practices. (DM)

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PSYCHO-SOCIOLOGICAL RESEARCH INTO THE PATHS AND PHASES OF INTELLECTUAL MATURATION AND THE DESIRE FOR KNOWLEDGE (FROM CHILDHOOD THROUGHOUT LIFE)

by

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INTRODUCTION

The notion of permanent education is one for which no term existed until comparatively recently, when it made its appearance in the vocabulary of some of the more highly cultivated nations, but the term itself carries more than one connotation and some attempt, however inadequate, at defining its exact content is indispensable. The association of both words in a single phrase might almost be described as a neologism, in the sense that it is only now, in the second half of the 20th century, that it has become possible to qualify the abstract noun "education", by the adjective "permanent" without appearing to indulge in a piece of either surrealism or double-talk. Today, however, it is accepted usage in all modern languages, and no study of the vocabulary of the human sciences since the second world war would be complete without a full definition of it. Whatever may be one's theoretical reservations, the fact that the term has now its date and place in history means that we cannot omit the concept from our calculations.

Our present investigations will have greater pertinence if we begin by considering the term's various connotations The mere fact that it consists of two words inevitably conjures up the sense of each, and reminds us that the concept was, in its origins, a controversial one. The traditional view - widely held but none the more admirable for that - was that education could last only for the restricted period from early childhood to manhood and that any attempt to introduce it at another age would be misguided. Hence the uproar created by the use of the word "permanent". Nowadays, however, it has become the custom to extend education to the pre-school period, through the use of institutions of the kindergarten type and also, less obviously but perhaps more significantly, by schemes for teaching parents how to bring up their children and encouraging the use of contraception with the ultimate purpose of preventing children coming into the world except in suitable conditions. Talk of pre-school education is therefore in line with current trends which may not everywhere be fully comprehended at the moment but which nevertheless exist. Talk of post-school education, however, is still apt to sound something of a paradox.

In our present context, the word "permanent" takes on a signficance which demands careful definition. It does not mean "continuous" in the ordinary mathematical sense which would imply a Utopia in which education began in the womb and ceased only in the grave. What it really implies is that education ought not to stop at a given moment; but that it can be interrupted and

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later resumed. It implies different ways of plotting the time-span of a single phenomenon. In this sense, it conveys a desire not to limit education to a certain period in an individual's existence but, after what is traditionally regarded as the completion of his studies, to provide subsequent periods of further education which he can combine with his daily life and occupation, without breaking the continuity of either.

What is needed therefore, is a fresh look at the relation between the individual and the plotting of the time given to his education. In addition, we must be ready to question two assumptions ordinarily regarded as self-evident. The first of these is that education should take place during the second stage of childhood and adolescence; the second is that it should be continuous during that period. Permanent education is impossible unless we can come to accept these two assumptions as representing no more than one educational possibility among many, so that education will cease, at least in certain respects, to be based on Euclidian principles. Our traditional assumptions will then be replaced by two principles of a far more general nature. Firstly it must be realised that education can take place at different periods of existence and that there is no need to restrict it to what we have come to regard as the usual age, the result being that permanent education can apply to any period of a man's life, up to and including retirement and old-age. The second principle is that education can be interrupted for long periods and resumed again later and need not be in any way linked to the concept of continuity in time; in other words, it can supervene at odd, unconnected periods.

It goes without saying that all these questions are bound up with a concatenation of historical and economic contingencies divorced from which they will remain wholly utopian. It is no mere chance that has caused the question of permanent education to arise during the second half of the 20th century, against a very special political and demographic background. Moreover, its promoters are anxious that, unlike technical re-training which is only one of its aspects, permanent education should contribute to the development of the whole man, and it is impossible to reflect on its content without realising that it implies the existence of a scale of values which must be clarified before practice can take the place of theory. One element in permanent education is the pleasure produced by the acquisition of knowledge. As distinguished somehow from the mere acquisition of additional technical skills, this presupposes a certain desire for knowledge, which has no end other than its own satisfaction since what we are concerned with in this study is promoting man's good, not his productivity. In other words, no matter how clear an idea we may have of the content of permanent education, we have also to pre-suppose the existence of a certain appetite for knowledge because no one will seek permanent education except to satisfy some craving in himself, regardless of any external advantages it may well bring him.

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Let us therefore leave the choice of the historic, economic or sociological content of permanent education to the specialists, and confine ourselves to its psychological basis, allowing our investigations some degree of free rein. Whatever its content or justification may be, the concept of permanent education implies in the individual a certain development in time of the desire for knowledge, which may vary from one period of his life to another but which must be taken into account in the preparation of any practical scheme. This should lead us to try to assess such of our present psychological knowledge as will enable us to distinguish with accuracy the different phases of man's advance towards intellectual maturity, and his desire for knowledge, from childhood up to and including the "third age". To carry out this task adequately, we must begin by assessing the conclusions recognised as incontrovertible reached in the various branches of psychology which relate to our enquiry. While covering as much ground as possible, our investigation will not always be able to follow a rigid plan because psychology today, though still regarded as in principle a single discipline, is composed of a number of branches only very loosely connected with each other. In addition, we shall discover many gaps in our knowledge, and hence many questions to which psychology is still unable to provide answers. When we have completed our investigation, we must stand back and assess its results critically so as to see how far the information we have assembled is relevant to our purpose. Lastly, we must lay down some guiding lines for future research capable of completing our present knowledge.

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I. WHAT WE KNOW OF PSYCHOLOGY

We shall obtain the information we are seeking only by investigating the various fields of modern psychology; but we should not expect these to reveal either a unitary principle - the present state of our knowledge allowing us to form more than one concept of the evolution of man's intelligence - or to point to one branch of psychology as being superior to the rest, since even genetic psychology cannot offer us a complete picture of this field of knowledge. We shall therefore try to distinguish the respective contributions of experimental psychology, genetic psychology (which covers a great deal more than mere child psychology), and psychopathology to the sum of our knowledge of psychology as a whole.

1. Experimental psychology

By experimental psychology is meant the study of man and of certain animal species, the latter studied not for themselves (experimental psychology not being synonymous with ecology), but as offering examples of functional characteristics which exist in animals in a comparatively simple state, but which, in man, have reached an altogether higher level of complexity. Studies relating to man invariably begin with experiments using a relatively simple model, where the variables can be controlled (e.g. tasks involving a number of choices) which is then modified at a later stage in order to measure man's concrete activities. In either case, the use of the model and the practice of extrapolation remain essential.

The first stage of research deals with the reception of messages or information and this, in the present context, presents a dual interest. In the first place, it revolutionises the concept of threshold, because what is received is not a stimulus but a signal. Hence, this represents a first step towards communication by means of words, and makes it possible to try to measure the optimal amount of information receivable by a living being within a given time unit. In the second place, the extent to which the stimuli can be received as signals depends upon the degree to which prior practice (or conditioning) has permitted the establishment of a process, the key to which is a pattern of conditioned responses. In other words, ability to receive stimuli in the form of messages depends not only on the structure of the sensory receiving apparatus and nervous system, but also on the sum of the earlier stimuli and the length of time during which they have been administered. Hence, it is almost impossible to draw a hard and fast distinction between the practice or conditioning and the actual receiving of the information.

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Conditioning remains one of the licensed fields of experimental psychology and the use of the maze, with all its possible permutations and combinations, continues to be one of the techniques most widely employed because it will produce statistical results. It has permitted the formulation of a number of laws as a result of which learning is one of the phenomena on which experimental psychology is best informed. In fact, the vital point is probably not to try to discover whether conditioning can be explained entirely in terms of trial and error, or whether a place must also be allowed to insight, as suggested by the theory of form. Nor should too much importance be given to mathematical models, of the type introduced by Hull, which ultimately furnish us with no more than a summary of the phenomena under consideration as a whole. The essence of the knowledge acquired about learning is that the main elements in conditioning are identical in the case of all vertebrates so that, in this respect, comparative experimental psychology becomes identical with general experimental psychology. Certain formal elements of conditioning exist independently of the species concerned, and are to be found equally in man and in the lower vertebrates.

Lastly, experiments have provided us with a certain amount of data on the extent to which information received is retained. Here there are two fields on which a considerable body of knowledge exists, one relating solely to man and the other to all vertebrates. A special study has been made of the phenomenon of forgetfulness, in connection with the disappearance of the conditioned response which shows that the stimulus needs to be renewed from time to time if the conditioned response is to continue to be made. In the case of man, two correlated data are required before his capacity to retain information received can be determined. The amount of information that he can retain being limited, the retention of fresh information is possible only on condition that he forgets a part of what he has received formerly. For a given individual, however, the maximum amount of information he can retain varies according to the extent to which the various items are interconnected and form a coherent whole; the more this is the case, the higher his level of retention will be.

There is one comment which provides a more radical turn to the knowledge thus provided by experimental psychology. All experiments with animals are based on the supposition that the subject must be provided with a motive for traversing the maze or solving the problem-box and this is what makes it necessary to use such incentives as hunger, pain and pleasure, although in general these are not applied according to any scientifically

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prescribed method. It is nevertheless impossible to study the process of conditioning and retention by experiment without some means of ensuring that the animals do in fact follow the paths of the maze and try to get out of the cage. If that aspect is so rarely noticed, this is probably because in human experimental psychology the factor concerned is already present so that research work can be carried out: experimental subjects have to take part willingly, whatever their motives, in order that the experiment can take place, even if these motives have nothing to do with its programme.

2. Genetic psychology

Genetic psychology is not restricted to child psychology, which is only one of its facets, but endeavours to describe the development of the human being from birth to old age; in the present state of knowledge however, it concerns itself almost entirely with the child and the adolescent and deals only in a fragmentary manner with adults. It supplies very inadequate information concerning a long intermediate period.

(a) Child psychology

This subject has become known thanks to a number of strictly genetic research projects and to the results of psycho-pedagogical studies. The psychology of the child and adolescent, as understood in modern times, is expounded fairly comprehensively by many writers, such as CLAPAREDE, GESELL, K. KOFFKA, H. WALLON and J. PIAGET. The theoretical origins and basic inspirations for their research projects differ very greatly and are often contradictory, but their positive results tend to converge to a certain extent, and nothing is lost by offering a summary which accentuates their common aspects rather than their differences.

The first point is without doubt the continuity between the psychomotor development of early childhood (which begins during embryonic and foetal life as GESELL's book shows) and the later development of intelligence through the stages of perceptive acquisition, adaptation to language and finally schooling. Thus there is a form of continuity from the reflexes of ocular fixation

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to the acquiring of grammar and mathematics, to the extent to which these are ever more highly adapted responses by the organism to increasingly complicated environmental situations. This means that in certain respects the genetic psychology of intelligence can be understood in terms of the development of the instrumental functions, knowledge appearing as the co-ordinated behaviour of a multiplicity of investigating instruments when faced with the reality of the surrounding world. The development of instrumental means of intelligence goes hand in hand with the growing maturity of the nervous system and it has long been known that there is a parallelism between the development of aptitudes and the myelinisation of the white fibres. Moreover, to speak of intelligence in terms of instrumental means and to emphasise the links its development has with the brain structure amounts to saying one and the same thing: that, in two different ways, the adaptation of the human organism to its surrounding world is carried out in gradual intellectual and specific steps which are mostly identified with the nervous apparatus that serves as a functional basis. Mention need only be made of the general scope of conditioned reflexes, as explained by PAVLOV in the second part of his work, in order to realise that the structure and functioning of the nervous system enable it to correspond to the totality of the surrounding world and that with the second system of signals - in the PAVLOVIAN sense of the word - the acquisition of language can be classified among the specifically neurological models.

This development of intelligence, which is more or less continuous from the first motor reactions up to the acquiring of knowledge at school, is often described in terms of assimilation and adaptation. These two terms, which are peculiar to PIAGET's work, but which recur in essence in all contemporary genetic psychology, imply that in its relations with the world, the living organism (in this particular case, homo sapiens) always makes use of two simultaneous processes, one of which consists in retaining the completely subjective picture of the material world as already perceived, i.e. by assimilating that world to the subject, and the other in admitting the existence of things as they really are and accepting the independent existence of the material world by adapting the subject to that world which he himself is not and on which he has to model himself. This presents a picture of the evolution of intelligence, which appears as a natural development of a multiplicity of operatory functions linked to the structure of the nervous system and capable of assimilating the material world. The result is thus a "natural history" of intelligence - within the meaning that this term, first used by BUFFON, acquired in the 18th century -

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which consists in reporting on human behaviour, interpreting it according to the maturation of the nervous system and, by means which are in the last resort Pavlovian, explaining the indefinable way in which it grasps the material world.

Two additional comments should make it possible to give these positive acquisitions their true meaning in contemporary research. It should be noted that in clinical psychology and neuro-anatomy all studies show clearly that the instruments of intelligence lose their power very early. It is known that the total quantity of neurons is acquired at birth, that neurons are cells which differ far too much from one another to be able to reproduce, and that from birth to death, man loses every day a certain number of these cells which are obviously not replaced. That is to say that the neuronic substratum of the instruments of intelligence is bound to diminish; its functioning, however, is not purely and simply restricted by that process, for over a number of decades the negative phenomenon of the loss of neurons is more than offset by the acquisition of knowledge, so that the graph showing the anatomo-physiological potential over a period of time is the algebraic sum of two curves, one falling from the outset and representing the anatomical deficit, the other rising over a long period, and then falling illustrating functional adaptation and acquisition; this sum produces an overall curve, which rises at first, then remains level from adolescence to middle age and finally falls. Moreover, all research work into clinical psychology confirms this point of view and psychometric studies (TERMAN, SPEARMAN, WECHSLER) show that intelligence looked at from the instrumental point of view either as general intelligence, or as a series of specialised aptitudes, develops as the combination of two factors - the resources directly dependent upon the neuronic apparatus and gradually declining from the age of about 25, and the possibilities connected with learning, mnesic structuration and experience which more than compensate for that deterioration until the period of involution or middle age.

However, almost all methods of clinical psychology which make it possible to study the development of intelligence and to acquire an idea of its genetic aspects are linked in many ways to school and educational techniques. To be sure, we are no longer exclusively dependent on the scale drawn up by BINET and SIMON, and modern psychometry is endeavouring to break loose from the attitudes of school education; the very concept of a scale of performance (as opposed to the verbal scale) is itself evidence of an attempt to assess the individual aptitudes of a subject, in

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isolation from his language, which is a reflection of the ambient civilisation. Thus we are in fact relying on investigation methods whose aim is to isolate the fundamental aspects of intelligence which might be said to be anterior to education and culture and to owe nothing to them.

It is nevertheless true that all psychometric procedures which help us to determine the genetic psychology of intelligence were conceived of within a certain educational theory, their only possible starting-point even if they often questioned its value. In other words, even if their upshot was to militate against a particular form of education, psychometric arguments were based on a genetic and differential assessment of intelligence worked out within a given framework c educational media - often a very broad one. Thus it is not certain that these genetic views can give rise to radical innovations: it is not enough to be aware of their dependence on our educational background in order to free ourselves from it, for the problem concerned goes much deeper than the need to free oneself from the prejudices of one's own culture.

Indeed when we try to disregard our educational background our purpose is to take into account only the development of intelligence as we know it: we hope to break with these educational habits in favour of a corpus of knowledge directly related to the development of intelligence. But such knowledge is derived from this self-same educational background and because of its origins cannot question these educational habits radically. That is a fundamental difficulty which is extremely hard to resolve.

But it must be recognised that the research work so far mentioned is concerned with only a part of genetic psychology and explains only a sector of the development of relations between the child - later the adolescent - and knowledge. All the works which we have just referred to deal with the need for knowledge as the use of the instruments of intelligence but do not say anything about the relations between the need for knowledge and emotive life. Yet the psychologist cannot accept it as gospel that there is no link between these two fields, even if in fact the chief disciples of both have deliberately ignored one another. We must, then, take into consideration the contributions, even partial, of the psychology of emotivity to the study of intelligence (S. FREUD, E. PICHON, A. FREUD, M. KLEIN).

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A number of points fundamental to the emotive issue are, moreover, revealed with a precision which we are scarcely accustomed to expect from a study of emotivity in view of the basic prejudices which the very word "emotivity" constantly arouses because of its semantic field, and that precision can be expressed at two levels. The study of childhood through the psychotherapy of neurotic adults, followed by the more direct knowledge of children themselves, reveal first of all that the satisfaction of the thirst for knowledge is generally situated in the period commonly known as the "latency" stage passed through after early childhood and before the onset of puberty, that is to say between two phases which can be characterised in very different ways: the first years of childhood coincide with the myelinisation of the axons, the dormant phase of the genital glands and the relation between the genital glands, the antehypophysis cerebri and the solution of the oedipus situation: puberty is marked by the maturity of the genital glands, the acquisition of secondary sexual characteristics, the physiological actions which this makes possible and the transition from the imaginary to the real in sexual life. During the latency period, the act of acquiring knowledge is reflected as a form of sublimation in a certain satisfaction of the libido and in material satisfaction; the child of eleven years who is introduced to algebra satisfies in a sublimated manner impulses which he is unable (which his body is still unable) to satisfy in a concrete manner, but on the other hand he does really learn algebra which becomes one of the basic methods for rationally grasping the material world.

But three further comments will give these ideas a more radical slant. Obviously, if the introduction to knowledge comes after the surmounting of the oedipus period, this is firstly because the introduction to knowledge and the pleasure of acquiring it are connected with the parental roles: self-satisfaction in acquiring knowledge means that the individual is either identifying himself with his father, or is opposing this process, for knowledge can be both a means of identification - placing knowledge at the centre of his life, like his father i.e. introducing himself to life by means of acquiring knowledge - and a means of acquiring independence by acting in a different manner Knowledge is thus a means of solving a particular aspect of the oedipus situation. That does not in any way mean that knowledge is limited to that process, although it can play a fundamental part in this. When FREUD makes a radical distinction between sublimation and repression, he does so in order to reveal that a true understanding of the material world can be obtained only at the expense of a certain amount of libidinal energy, and that knowledge is not acquired without effort.

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It should also be noted that knowledge appears in a context, namely the latency period, which is in no way autonomous and can exist only in relation to a primitive situation to which it refers. Study of the first year of infancy (M. KLEIN, SPITZ) shows that the initial situation of the living being is in fact not that of a move towards the perception of the material world, but a form of narcissism and that access to the material world is gained through outside forces.

These two remarks give rise to a third. Contemporary psychology can no longer consider the exercise of knowledge as purely and simply the spontaneous use of instrumental functions since knowledge implies outside intervention. There is always a need to realise that access to knowledge and its proper use cannot be described in terms of merely putting into practice pre-existing possibilities, but require us to take into consideration the meaning which knowledge has in relations between human beings.

(b) Gerontology

The thirst for knowledge in later life has been much less thoroughly studied and our information here is still very fragmentary. Two fairly different factors can be isolated. As already pointed out an analysis of the development of aptitudes reveals that they begin to decline fairly early but that the effects of their decline are offset for a long time by experience acquired and by memory. It must be recognised, too, that a quantitative study of these phenomena still remains to be made - WECHSLER's concept of the deterioration index can give only a fragmentary picture. Such research work is also unsatisfactory in that it takes account only of chronological age (measured by cosmic time), whereas it should be possible concurrently to take into account a biological characterisation of age and a demographic reference, insofar as age has a meaning only in relation to the biological ageing of the organism and its position on the age pyramid. Biological and demographic chemistry are thus fundamental sources but are difficult to use.

But gerontological research work concerns us from another point of view. Alongside the study of cerebral decline a series of investigations deals with the very complex question of retirement - related simultaneously to the phenomena of cerebral and endocrine abiotrophy, an alteration in the

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pragmatic grasp of the world, and the reduction in the powers of the libido, Yet it is noted in such a situation that the acquisition of new knowledge can be compatible with decline and that the reduction in the libido sciendi may be largely offset by an activity in the nature of a sublimation: knowledge of the psychological processes of an elderly subject obliges us to take into consideration the reciprocal relation between a certain deficiency in the means for acquiring knowledge and an increase in the motives for learning.

3. Psychopathology

The psychological study of the various fields of pathology could provide us with numerous indications concerning inadequacy in the development of intellectual activities, peculiar to the stages of oligophrenia and the decay of these activities due to mental disorders. Thus there is indeed a - partially autonomous - pathology of intelligence which furnishes many cases where a cerebral impairment results in either the partial or the complete disappearance of a particular aptitude for learning or makes it impossible fully to acquire such aptitude. Hence pathology shows clearly the links between the instruments of learning and the cerebral characteristics of the individual. We cannot dwell upon the subject here, but two specific fields should attract our attention.

In many cases where the development of intellectual aptitudes is normal and where no instrumental deficiency can be found, it is seen, during childhood and adolescence, that the subject concerned is unable, for neurotic or psychotic reasons, to use the instrumental means in question. Hospitalisation, described by SPITZ, is a prime example of this; here we are dealing with children who for various reasons are isolated during their early childhood and spend many months in hospital institutions where nobody can play the part of the parental figure; in a high percentage of cases, such children, in spite of the quality of their mental standards as shown by psychometry develop only mediocre intellectual powers in later years unless they are given the appropriate psychotherapy. This infers that it is difficult to consider intellectual aptitudes as mere instruments existing in their own right and independent of any context, and they must be looked upon in the light of the individual case-history

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which determines them: therefore is there any sense in regarding them as instrumental functions? Cases of infantile schizophrenia give rise to similar comments: pathology shows many subjects who, despite intellectual equipment which psychometric techniques force us to regard as normal, give evidence of no better intellectual adaptation than that of severely affected oligophrenics. Schizophrenia in the adult reveals situations which are often very similar: the intellectual equipment remains intact but it ceases to be used emotively and for that reason, whilst still being potentially available, can no longer be used at all.

To deal with a less serious problem, heterogeneous troubles which it is expedient to classify under dyslexia call for similar comments. Here we are dealing with a subject of normal intelligence but for whom access to the written language is almost impossible, in that for motives connected with both lateralisation troubles and neurotic inhibitions, reading and writing are inaccessible. Appropriate re-education causes these phenomena to disappear. They provide an example of the blocking of the desire to learn - an inhibitory process quite independent of the effector mechanisms of the intelligence, capable of removal by suitable therapy, and in itself evidence of the relationship between intelligence and emotive engagement.

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II. OUR CONCLUSIONS CRITICALLY EXAMINED

A study of the numerous contributions by the various branches of psychology has thus furnished us with a body of information whose implications must now be analysed. Some, we feel, are mainly positive in significance in that they provide certain information concerning the development of the means of acquiring knowledge; others reveal the shortcomings of this information and show the need for further studies which might well partly offset the gaps in our knowledge.

1. Positive significance

We have, then, emphasised a number of known data peculiar to the development of the means of acquiring knowledge. From them there emerges a composite picture of development from aptitudes to knowledge and, in certain respects, we thus arrive at a sort of natural history of the desire for knowledge in homo sapiens. These data may be resumed in a form of a time-scale whose main aspects closely resemble the life-history of a particular biological function, sufficiently exemplified by the development and decline of the ovary or testicles.

We have seen, firstly, that the means of acquiring knowledge have a certain temporal development which continues throughout life and at a particular moment in time corresponds to the algebraic sum of a number of factors hereafter specified. In essence, this development is identical in animals and man, or more exactly in homo sapiens and the other mammals. Apart from a few minor differences, throughout a process that is continuous from conception until death, the nervous system (and in particular, the brain) develops on the following lines: it begins, exclusively during the embryonic and foetal period, with the formation of histological structures peculiar to itself; then, after birth, comes the myelinisation of certain white fibres, rapidly followed by the destruction of the neurons which starts early and is never made good, since nerve cells differ too greatly from one another to allow of their reproduction.

Therefore, the purely instrumental aspect of intellectual maturation, seen from a strictly anatomical point of view, would reveal only a falling-off, beginning very early and continuing without pause until death. Yet observations do not confirm such a development which must be offset by the action of two other factors at least. From the physiological point of view it should indeed be noted that a straightforward neuron count

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does not give an exact picture of the overall functional value of the neurons, since this is related both to their absolute number and to their functional ramifications, just as the absolute number of monetary tokens does not suffice to characterise the economy and account must also be taken of the speed at which they circulate. In fact, neuronic activity is dependent both on the number of neurons and on all their functional relationships. Consequently for a very long time the increase in the functional relationships between the neurons more than compensates for their loss in number so that physiological development does not decrease until maturity whilst anatomical development is negative from the beginning. It should also be noted that for a long time that which is acquired makes a positive contribution in the sense that it facilitates intellectual activities up to a saturation point which differs very widely but is rarely achieved.

Thus the development of the instrumental aspects of intelligence shows a remarkable harmony between neuro-physiological data and genetic psychometry. The whole can be summed up in a graph whose two axes are time and intellectual potential respectively: the curve rises until the end of puberty and then more or less levels off until middle age sets in, when it begins to descend rapidly. The interpretation of this graph must be qualified by two remarks concerning the choice of axes. It is not at all certain that the time factor is homogeneous here along the whole length of the axis until death, for there are far more changes from the first to the tenth year than from the thirtieth to the fortieth, so that the unit of measure is very heterogeneous: we are not dealing with a reversible time-continuum but with the chronological classification of unconnected periods; the literary expression "the ages of man" perfectly sums up the mathematical structure of these temporal references. The practical use of cartesian co-ordinates must not cause us to lose sight of this peculiarity of time. Moreover, the axis of the ordinates corresponds to a certain measure of the intellectual potential classified according to a univocal series; but such a series assumes that the various scales which are used to identify intellectual potential can be reduced to a single linear order. This logical operation is not always possible and it is above all the differences which are heterogeneous: the increase in intellectual potential between five and ten years is not comparable to the growth between twenty and twenty-five so that it would be inaccurate to regard for example the second as equal to a quarter of the first. It is only within each period that

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rigorous comparisons can be made which prove illusory when used to compare one period with another. That is why we must pay extremely careful attention to the correction of a phenomenon which was already referred to when we pointed out that the level of intellectual potential remained more or less constant from the end of puberty until middle age. In truth, if the graph in question is looked at closely, it will be seen that at the end of puberty and at the beginning of middle age, there are two singular points where the derivative becomes indefinite and which correspond to what is called "the point of inflection" in analysis. They denote the fact that the meaning of development is different before and after a given period. It should also be said that from the end of puberty to middle age, although the curve appears to flatten out at first sight, closer investigation of the facts shows that it rises slowly, reaches its maximum at variable dates and then declines gradually. In other words, the development which takes place in this period is not accurately assessed by a scale which may well suit the beginning and the end but which is not relevant during those years. Despite these reservations the general pace of development retains an indicative value which is a fair enough summary of our knowledge.

However, contributions from certain specialised sectors of genetic psychology and psychopathology showed that assessment of the need for knowledge was scarcely possible without bearing in mind its emotive aspects: more precisely, knowledge strove towards its aims only if it instinctively felt them desirable. In other words, the desire to know is an inescapable factor. That is already clear at the level of animal psychology, for, during experiments, it is assumed that the rat tends to go through the maze only if he is motivated by hunger or an unpleasant stimulus which he wishes to avoid. Punishment and reward remain the basic operative notions of experimental psychology.

Now, in man, the desire to know stems throughout his whole development from a combination of two orders of factors, which endow the objects to be known with the qualities that make them desirable: it is also intrinsic both to men and to the objects themselves. The first of these factors is historical and sociological: the acquisition of knowledge appears desirable to the extent to which culture has already made it appear as such, for a number of different motives. Firstly, these

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acquisitions can play a part in the development of existence and in numerous occupations it is indispensable to increase knowledge in order to keep up or to make progress. Moreover, in our civilisation, and for reasons whose origins should be analysed, culture has a prestige of its own which makes its acquisition desirable for its own sake, inasmuch as it remains the inescapable prerequisite for attaining a certain image of man generally held to be worth striving after. The desire to know is then wholly mediated by the desire of others, but the motivation remains essential, and mediation through the desire of a third party does not mean for one moment that such a desire is illusory.

But such mediation is possible only for reasons of a different nature. During the emotive development of infancy and adolescence, pathology offers many cases where the means to obtain knowledge exist but are hardly used because, for pathological reasons, knowledge cannot be experienced as desirable and its acquisition is barred. Pathology does no more in such cases than magnify a very general process: access to knowledge in the case of a child always means self-identification with the parents' access to knowledge and acceptance or refusal of a part which has already been played. There we find, but at a more primitive level, mediation through the will of others.

Thus it must be said that the general development of the phases of intellectual maturation and the need for knowledge correspond to the sum total of two simultaneous developments, that of the instrumental means and that of the desire to know; it therefore seems easy to construct a third graph by adding algebraically for each temporal value in the abscissa, the values of the instrumental means and of the desire to know. In fact, this operation seems hardly worth while because of the heterogeneity of the terms. The development of the instrumental means measures that of qualities inherent in the individual, which are very directly linked to the structure of his nervous system. The development of the desire to know is related to a phenomenon which is just as natural as the preceding one, but which is connected with the whole body of the relationships of the subject and his entourage, so that it is no longer possible to regard it as an independent characteristic of the individual. Hence if this heterogeneity is respected, one can no longer justifiably add up these two factors algebraically: here we come up against a very significant limit to our psychological knowledge. Nor do we believe that this antinomy is peculiar to homo sapiens: it seems that it can be found at least among higher mammals.

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2. Negative significance

The studies whose contribution to the problem we have analysed contain a number of weaknesses which we cannot evade. Firstly, the most rigourously established facts concerning the phenomena of learning are those established by means of experiments on animals. Two questions arise here: to what extent can we extrapolate facts obtained from the white rat or the golden hamster to man, and, above all, within what limits can we admit that the elementary phenomena of learning thus revealed constitute a model for the phenomena which concern us in man? Briefly, what is most convincingly established is least easily transferable, for the more precisely the model is known, the further away it is from the phenomena which it is supposed to illustrate.

Moreover, pathological data may be used only indirectly. They show the dependence of the need for knowledge on the brain and on desire, but that is a piece of information which is based on negative foundations. In this case pathology has no positive contribution to make.

Lastly, genetic psychology offers well-founded information only for the periods of early childhood and adolescence and deals very superficially with the age of decline. The whole intermediate period of maturity is scarcely known, and there is no body of knowledge dealing with it as the classical works of PIAGET or WALLON do with childhood. That is a serious gap which is in no way bridged by fragmentary studies on vocational aptitudes.

3. Practical applications

The balance of the positive aspects and the gaps in the contributions of psychological knowledge to the problems of permanent education make it possible to put down a few practical points which must now be explained in more detail. It seems that, in spite of its provisional and imperfect character, our knowledge already suggests a certain number of applications without its being necessary to await the rounding-off of the theory - an improbable event - before these are put into practice.

(a) Genetic psychology and psychopathology converge to show the extreme importance of the period between the third and sixth year when the Oedipus situation of the child is resolved and when he takes his first step in the use of reason which has both affective and instrumental foundations.

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The exact age can vary according to the child, but the fact remains that it is between early childhood and the first school year that the first intellectual capital begins to have a relationship with objects offered by the surrounding world. That is why special attention should be paid to the kindergarten and nursery school. Naturally there can be no question of selecting highly gifted children who could assimilate the first year primary curriculum while still at nursery school. Rather should we reflect seriously on the content of this pre-school teaching: in our opinion, the early stages of learning must not be focused solely on non-verbal conditioning making no use of the second system of "signals" (as understood by PAVLOV) and situated outside symbolic factors, nor should it be stuffed with material borrowed from traditional primary teaching. Thus, the problem is to determine the types of conditioning likely to avoid these two stumbling-blocks.

These observations should be supplemented by a few comments. Firstly, it can be seen that the organisation of curricula according to age groups is determined, not, as is often claimed, by the natural needs resulting from genetic psychology, but by historical, social and economic needs which preclude the serious organisation of schooling early enough and a sufficiently thorough training of the teachers. It is evident, indeed, that the pedagogical aspects of nursery schools, where these observations were taken into account would be a complicated matter, calling for special teacher training facilities. Moreover, since the child's aptitudes differ very greatly from one subject to another, only techniques based on programmed teaching can be suitable. Lastly, it is no longer possible to delay the entry of the child to the world of reason under the pretext that he is not old enough.

(b) We have stressed the importance of the latency period which, between the second stage of childhood and the beginning of puberty, corresponds to the constitution of the sublimations necessary for the intellectual tasks to be performed emotively. This period is crucial because it is the moment when the libido can be used to facilitate entrance to reason and the acquisition of knowledge. It is occupied by primary teaching and the early years of secondary education, from first year primary up to the statutory school-leaving age. This is a period which tends to be neglected at present, to the extent

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that the training of responsible teachers is increasingly inadequate - a notable paradox in our primary and secondary education. It is, in fact, so organised that the best teachers are bound to wish to teach in the terminal classes and the hierarchy is such that the greatest kudos attaches, in France, to teaching those classes where pupils are prepared for the "Grands Ecoles". Yet, from the point of view of educational theory, it is far more difficult and more important to deal with children during the period when sublimations are most active than to prepare adolescents for competitive examinations. What is being questioned here is the social image of the teachers' hierarchy: we should eschew the muddled thinking whereby mastery of a difficult subject is ranked higher than the teaching of fundamentals. To teach the rudiments of algebra well to children of eleven years of age has far more educational value than to demonstrate STOCKES' theorem to budding polytechnicians: the jobs are too different for the second to be regarded as the full flowering of the first.

(c) We have seen how the processes of conditioning bring into play the instrumental means of knowledge and a system of motivations for knowledge, inextricably linked with the first sublimations, the images of reason in the development of children and adolescents and the prestige which historically forms part and parcel of the possession of knowledge. Indeed, the desire for knowledge, in spite of all appearances, is not spontaneous nor, what is more, is it autonomous: it is not self-sufficient and its basis lies outside itself. It depends upon the role played by intellectual capital in the evolutionary balance of the subject and for that reason cannot be regarded as an independent value.

The question, then, is how and to what extent it may be admissible, pertinent and effective to work out a new educational theory capable of taking into account these motivations peculiar to the desire for knowledge, both in adolescents and adults, and, perhaps, of encouraging that desire. There is, of course, no case for putting forward recipes aimed at guiding pupils in a desired direction (desired, incidentally, by whom and to what end?). What we must understand is that all educational activity corresponds, in a positive or negative manner, to the desire for knowledge, and alters that desire to a certain extent. It remains to determine the means: at present there is no research work available to help us do so.

(d) Lastly, in what way do the analyses contained in this report directly concern the problems of permanent education? First, our research clearly shows that current teaching practices in our civilisations correspond to what can be called, according to preference, ideologies or systems of values, and not to

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"scientifically objective" data, in that the sciences concerned and questioned are all bound up, willy nilly, in a spirit of conscious acceptance or rejection with our historical context. Other types of teaching are conceivable, and the authority of tradition is not that of knowledge. Moreover, permanent education can succeed, that is to say make people happy, only if it corresponds to certain desires for knowledge, for men can fulfil themselves by participating in knowledge only if that knowledge already has an intrinsic value. The raison d'être of permanent education, and its possible content, can be discussed only if it is understood that its existence depends upon its satisfying and thus fertilising the desire for knowledge. Only a rigorous analysis of the phenomenon of "libido sciendi" can hope to provide it with valid foundations.

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E P I L O G U E

Thus contemporary psychological knowledge can furnish certain theoretical bases for a study of the aspects and phases of intellectual development and the need for knowledge in man. However, these bases can be compared to what is known, for example, about the need for food according to age, only insofar as the need for knowledge, however dependent it may be on the neuronic apparatus, is not autonomous, develops only within a certain interhuman context and implies an already existing cultural background: this structuration is in no way mysterious, but does give rise to difficulties that are all its own.

Two types of research work hence seem to us essential to develop the study of a valid theoretical basis. Firstly, investigations should be made into the little known periods, attempting at the same time to determine what is the best way of splitting up the different phases and what period of time each covers. Secondly, it is necessary to work out a rigorous epistemology of the phenomenon of need itself in order to avoid its being lost to view as our study proceeds: adequate models for research are lacking and it would be very useful to create them. By so doing it will be possible to develop with scientific rigour the theoretical bases that psychology can offer to permanent education.

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